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Tweeting during food crises: A psychosocial analysis of threat coping expressions in  
Spain, during the 2011 European EHEC outbreak

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## Abstract

Food crises imply responses that are not what people and organisations would normally do, if one or more threats (health, economic, etc.) were not present. At an individual level, this motivates individuals to implement coping strategies aimed at adaptation to the threat that has been presented, as well as the reduction of stressful experiences. In this regard, microblogging channels such as Twitter emerge as a valuable resource to access individuals' expressions of coping. Accordingly, Twitter expressions are generally more natural, spontaneous and heterogeneous — in cognitive, affective and behavioural dimensions — than expressions found on other types of social media (e.g. blogs). Moreover, as a social media channel, it provides access not only to an individual but also to a social level of analysis, i.e. a psychosocial media analysis. To show the potential in this regard, our study analysed Twitter messages produced by individuals during the 2011 EHEC/E. Coli bacteria outbreak in Europe, due to contaminated food products. This involved more than 3,100 cases of bloody diarrhoea and 850 of haemolytic uremic syndrome (HUS), and 53 confirmed deaths across the EU. Based on data collected in Spain, the country initially thought to be the source of the outbreak, an initial quantitative analysis considered 11 411 tweets, of which 2099 were further analysed through a qualitative content analysis. This aimed at identifying: 1) the ways of coping expressed during the crisis; and 2) how uncertainty about the contaminated product, expressed through hazard notifications, influenced the former. Results revealed coping expressions as being dynamic, flexible and social, with a predominance of accommodation, information seeking and opposition (e.g. anger) strategies. The latter were more likely during a period of uncertainty, with the opposite being true for strategies relying on the identification of the contaminated product (e.g. avoid consumption/purchase). Implications for food crisis communication and monitoring systems are discussed.

Keywords: food crisis; coping; qualitative social media analysis; crisis communication

## Tweeting during food crises: A psychosocial analysis of threat coping expressions in Spain, during the 2011 EHEC outbreak in Europe

*“When adversity strikes, when mental and physical functioning and health are at risk, humans ‘fight back’”* (Skinner, 2007; p.245).

### 1. Introduction

Food crises are a major source of public concern. As with other health-related crises, they are characterised by a combination of “unexpectedness, high levels of threat, an aroused or stressed population, and media looking for breaking news stories” (Glik, 2007; p.35). Other dimensions, such as the novelty of the risk, its controllability, dreadfulness, or degree of voluntary exposure (see e.g. Slovic, 1987) also determine public perceptions of health threats related to food. However, to fully understand the processes that take place during a crisis — and to manage it and intervene accordingly —, assessing how people perceive threats and the context in which they occur is not enough. We should also try to understand their responses to the events they are presented with and their way of coping with them — which usually focus on the threat(s) posed by biological/chemical hazard(s), the health risks deriving from the consumption of a contaminated product, and other associated aspects.

A food crisis, in fact, does not merely involve the perception of something that deviates from what was “normal” until a given event took place. It also implies responses that are not what people and organisations would normally do, if they were not under threat. In this sense, we define crisis as one or more *perceived threatening events that go beyond what is “normal” or expected, demanding non-routine organisational and individual responses*. At an individual level, these responses refer to coping — the various strategies that can be used by individuals to deal with stressful

experiences, which are expressed in recognisable manifestations or “ways of coping” (Skinner et al., 2003). These deviate from their “normal” activities, given that they aim to adapt to the threat(s), by gaining control over it and/or by eliminating it. Moreover, a crisis can often involve multiple threats, including not only health-related issues, but also threats to the economy, social identity (e.g. the country or other social groups), and others. To achieve this threat-adaptation goal, various affective, cognitive or behavioural coping strategies can be applied. Our contention is that knowing the variety of ways in which individuals cope with threats during crises, depending on the situation and available resources — their own and in the surrounding context —, provides important information for designing risk communication strategies. Accordingly, this can allow individuals to: 1) target the information to their goals and needs, and 2) take into consideration the situation in which they find themselves, this being a determinant factor for coping strategies.

Recently, social media has emerged as an important resource in guiding these communication strategies (see Rutsaert et al., 2012). Accordingly, there are a few examples of social media use in preventative monitoring of food-related threats (Newkirk et al., 2012; Wethington & Bartlett, 2004), in engaging with consumers during food-related crises (CDC, 2010), and in comparing different communication strategies between traditional media and social media (see Shan et al., 2013 for an analysis of media published during the 2008 Irish dioxin crisis). However, despite these exceptions, “very little work has been done to examine the implications of the explosion of new media and web technologies for food risk/benefit communication” (Barnett et al., 2011; p.8). Moreover, to our knowledge, social media analysis in general — and Twitter specifically — has not been used to assess individuals’ responses during food

crises, namely expressions of coping with food-related threats posed by chemical or biological hazards, in association with features of the situation in which they emerge.

### 1.1. Dynamic and social aspects of coping

The coping approach followed in this paper assumes that an individual's reactions are not simple, nor can they be reduced to a small set of emotional responses in situations pertaining to food crises (e.g. panic, anger). Individuals cope, both actively and differently, by drawing on a heterogeneous set of strategies, which can be more or less effective, depending on the adaptive function they serve (e.g. active search for information vs. denial). Despite the fact that these strategies are expressed at an individual level, people are not confined to their individual resources (e.g. problem-solving skills; knowledge about the food risk): they can also draw on social resources, such as other people's availability/ability to discuss the issue or to provide help. The social context can thus facilitate the adaptation process (Skinner et al., 2003), but can also interfere with it — e.g. by increasing uncertainty about which actions to take. As a consequence, coping can be both dynamic and social.

All this implies that people are both observers and active agents who can implement various ways of coping with threats in general, and food-related risks in particular, and adapt to new realities in the longer term. This is a dynamic process that depends on their resources and the ones available in their social context, allowing them to “fight back” (Skinner, 2007). In addition, the choice of coping strategies and their success can be influenced by the broader context, namely the characteristics of the events that occur during a certain period of time, the information available in the media and through other people, as well as other characteristics. For example, active search for information might be an effective coping strategy, if the information that is being



searched for refers to specific actions that the individual has the ability and the opportunity to implement. In this way, coping strategies are dynamic because different events, situations, and threats will demand different strategies, given that their threat-adaptation potential depends on the individual's resources and surrounding context.

In accordance, our paper aimed to assess which ways of coping people expressed on social media during a food-related crisis, as determined by the specific characteristics of the situation in which it occurred, particularly in Spain. We specifically expected differences in coping strategies as a result of events inducing changes in the situation, namely the communication of uncertainty about the hazard source, and also about the identification of the contaminated product(s). In this regard, although coping refers to individual actions, it “emerges from a system”, and thus “it is diagnostic of the entire coping system, of which the individual is just a part” (Skinner, 2007; p. 246). Therefore, coping assessment involves a psychosocial level of analysis, which takes into consideration not only the individual, but also the context in which events take place.

## 1.2. Crisis informatics

Despite the recognition that it is important to analyse people's coping, due to its “vital role in providing a counterbalance to the purely technical analysis of risk assessments” (Renn, 1998; p.61), little research was achieved during this crisis. Appraisal and coping processes are often analysed at a later stage of crisis development, or based on the outcomes of a crisis when, to all intents and purposes, it is over (Hooker, 2010; Puterman et al., 2009). Moreover, retrospective reports of coping have been shown to have low validity (Skinner et al., 2003), as they can be inaccurate and/or the relevant information may not have been conscientiously retrieved. Often, they

drew on self-reports at one point in time, and thus failed to assess dynamism in response to changing environments.

In this regard, social media represents a useful research resource, as its analysis allows the characterisation of coping strategies during crises as they occur. Specifically, it allows: 1) the collection of a wide diversity of messages produced by a heterogeneous group of people (giving access to a large sample and to real-time expressions of coping); 2) the extraction of data corresponding to different moments in time (capturing the dynamics of the ways of coping that occur over time); 3) to assess the intersection between individual and social responses, as social media is an interactive social environment, that allows individuals to express themselves, communicate, influence and be influenced by their social context. For this reason, it is a very good resource to study the reactions to a crisis from a psychosocial perspective, articulating the social level of analysis with individuals' responses.

On one hand, the importance of social media as a resource, as referred above, derives from the fact that it has become a part of daily life. On the other, people increasingly resort to the internet as a source of information in times of crisis (Google, 2011), with such search behaviour being enabled by its “around-the-clock” availability, its constant, routine updates, and its interactive news and information communication (Glik, 2007). This was how the field of “crisis informatics” emerged, which “examines the technical, social and information aspects of disasters and crisis” in the internet world (Palen, 2008, p.76). Examples of this can be aggregated into two areas: 1) Crisis prevention and 2) Crisis assessment. The first group includes examples of surveillance systems to track a set of “signs” that allow to predict a crisis or health epidemic. Culotta (2010), for example, demonstrated that, by tracking keywords like “flu, cough, headache, sore throat” and their associations, influenza rates were predicted with high

accuracy, with the results obtaining a 95% correlation with national health statistics. Other studies included geotagging (person and location), and observed social media interactions, to predict if and when an individual would become sick (Sadilek, Kautz & Silenzio, 2012). The second group includes the assessment of peoples' perception and concerns, by monitoring their messages on social media during crises and engaging with them (see e.g. Bruns & Liang, 2012). These include not only monitoring the use of a set of keywords referring to the threat itself (e.g. H1N1) and its associated health consequences (e.g. illness), but also their associations with people's concerns. One example was given by Signorini, Segre and Polgreen (2011) with regard to the H1N1 pandemic. During this crisis, indicators of public concern included keywords related to: disease transmission in particular social contexts (keywords: travel, trip, flight, fly, etc.), disease countermeasures (keywords: wash, hand, hygiene and mask), and consumer concerns about pork consumption (keywords: pork and bacon).

Despite the importance of these studies in preventing and monitoring health threats (see e.g. Eysenbach, 2009), they mostly focus on the reported health consequences (e.g. symptoms) and other expressions that might indicate individuals' perceptions and concerns. However, they do not focus on how people cope with crisis, and how the context influences their ways of coping, specifically when dealing with a food crisis. In addition, there is a methodological gap in these, as most follow a quantitative approach, which does not show the diversity of coping strategies that people can use during a crisis and how these can change, based on context changes (namely uncertainty). In order to fill this gap, we developed an analysis focused on qualifying coping expressions, based on a theoretical classification system (Skinner et al., 2003).

### 1.3. The study

#### *1.3.1 Research goals*

Due to the general lack of studies on food crises, with a specific focus on the dynamic and social aspects of the way people cope with them, our first research goal focused on crisis monitoring: we were interested in assessing the different ways of coping expressed during a food crisis.

For this we chose to analyse data from one social media channel — Twitter —, defined as a form of microblogging (Kaplan & Heinlein, 2010), which allows users to write brief text updates and to publish them, so that their network can view and comment on them. Apart from the advantages of using social media for studying crises, as identified above, there are also advantages in studying Twitter, in particular. This is because microblogs have been considered a very good source of “event-centric user generated content on social networks” (Sheth et al., 2010, p.1), produced as a response to breaking news and unexpected events. In addition, it has the methodological advantage of accessing messages limited to 140 characters, providing a more reliable amount of references to one or more topics and events. As it presents a simpler unit of analysis, it allows a more effective identification of both the quantitative (e.g. lower probability of keyword repetition) and the qualitative (e.g. less complexity in the content expressed) dimensions of discourse. Moreover, these short text messages are produced in a simple and fast way, by different types of people and groups, and thus give us access to different perceptions and reactions. Finally, given the simplicity and speed in content generation by users, it furthermore allows access to their quick spontaneous and affective reactions (see e.g. Thelwall, Buckley & Paltooglou, 2011), which may be less accessible in other social media channels, more prone to deliberation (e.g. blogs).

Our study focused on tweets produced during the 2011 Enterohaemorrhagic *Escherichia Coli* (EHEC) — a bacterial outbreak in Europe, due to contaminated food products. We conducted a psychosocial analysis of individuals' responses to events during the food crisis, and the corresponding demands (self and context) of the perceived threat implicit in these. A theory-driven content analysis was performed on the tweets as a way of describing the diversity of ways of coping expressed via these messages. This was based on the classification of families of coping by Skinner et al. (2003). To our knowledge, this is the first adaptation of coping to the analysis of food crises, from a health psychology perspective. At the same time, this is based on social media (specifically Twitter) data analysis, and as such we believe it represents a methodological contribution to coping literature, which seems to be lacking in these types of studies. At the same time, it represents a contribution to social media analysis literature, by following a qualitative approach, focused on showing the diversity of coping strategies, rather than solely focusing on a quantitative approach, based on their distribution throughout the population. Accordingly, studies on social media analysis focusing on keywords and their associations usually do not completely draw on the richness of individuals' responses to a crisis. Although they quantify responses and aim to identify patterns based on large data sets, they produce only a superficial analysis of the context in which they occur (for an exception, see Sadilek et al., 2012).

The diversity of these coping strategies results from a dynamic process dependent not only on an individual's resources, but also on the resources provided by the context. For example, in crisis situations, information seeking is an important way of coping, and thus individual behaviour is dependent on the attempts that are made to provide people with detailed information on how to act (see e.g. Reynolds & Seeger, 2005). However, sometimes there is uncertainty regarding the source of the risk (e.g.

which food product is affected) (Miles & Frewer, 2003), or alternative approaches a person could adopt (e.g. Weinstein, 1988; cooking procedures to eliminate a food product contamination), or uncertainty about how to deal with or reduce the risk (Miles & Frewer, 2003). This uncertainty can change along the hazard's timeline (Barnett & Breakwell, 2003), based on official communications that are gradually and continually being made available, and which focus on providing information about the biological hazard, the associated risk(s) in terms of health consequences, and the actions one can take to deal with it. In this regard, we aimed to answer a second research question: *is there any relationship between the uncertainty expressed in hazard notifications and the ways of coping?* This is based on the acknowledgement that people use coping mechanisms that can be “common as well as unique (...) in dealing with uncertain outcomes” (Renn, 1998, p. 61). In addition, uncertainty can increase risk perception and the level of distress experienced (Miles & Frewer, 2003). This distress, in turn, implies the use of more coping strategies — implemented as a response to threats (to the self or to the context) — than would generally be necessary as a response to challenges (to the self and context; Skinner et al., 2003). Moreover, it can be expected that the absence of information about the source of the threat (contaminated product) and how people can cope with it can constrain the use of coping strategies that rely on the self. In accordance, this can promote strategies that depend on the context, such as information seeking (e.g. search for information about how to cope) and support seeking. In order to test the influence of uncertainty on the variety of coping strategies used, a quantitative analysis of coping expressions was performed. This implied assessing their co-occurrence with official communications of certainty or uncertainty about what the contaminated food product and the origin of the outbreak (Spain or Germany?) were, and comparing their frequency in periods which differed in this certainty.

### *1.3.2 EHEC hazard sequence: the Spanish case*

The E. Coli/EHEC outbreak between May-July 2011 was considered at the time by the media, scientists, and organisations as one of the biggest food-related crises in Europe, due to biological contamination, and the largest outbreak ever registered of Haemolytic Uraemic Syndrome (HUS) caused by E. Coli (Jofre & Mujeriego, 2012). Starting on May 11<sup>th</sup>, the first reported cases of human contamination from E. Coli emerged in Germany (BVL, 2011; Clark, 2012), from an unknown food product source. These cases started growing in number in the following days, receiving increased media attention. On May 25<sup>th</sup>, the first official communication was issued by the German authorities, advising the public not to eat tomatoes, lettuce and cucumbers. This was followed the next day by a communication from the Hamburg health authorities, stating that cucumbers were identified as the source of the outbreak, and Spain as its origin. On May 31<sup>st</sup>, doubt starts being cast on cucumbers as the source of contamination, which was confirmed the following day. This led to a period of uncertainty about the source of the biological hazard, which lasted a few days. On June 5<sup>th</sup>, suspicion was expressed over the possibility that vegetable sprouts were contaminated and Germany was the origin, which was confirmed on June 10<sup>th</sup>. This was followed by a French outbreak around June 24<sup>th</sup>. Suspicion was again raised that sprouts were not the source (July 1<sup>st</sup>) but rather fenugreek seeds, which was confirmed on July 5<sup>th</sup>. These represented major hazard notifications in the EHEC outbreak, either communicating uncertainty or doubt about the contamination source and origin (June 1<sup>st</sup>, June 5<sup>th</sup>, July 1<sup>st</sup>) or certainty about it (May 25<sup>th</sup>, June 10<sup>th</sup>, July 5<sup>th</sup>). These and additional days in the EHEC outbreak (see table 1) were the basis for answering our second research question, in order to analyse the co-occurrence of communicated uncertainty and expressions of coping.

[Insert Table 1 about here]

During the occurrence of these events, there were several suspicions of cases of EHEC/HUS cases in the media, initially only in Germany, but subsequently all across Europe. The suspicious cases identified in Spain mostly concerned the identification of people who had travelled abroad to countries where there were already confirmed cases. By the time the outbreak officially ended, there were more than 3,100 cases of bloody diarrhoea, and more than 850 of haemolytic uremic syndrome (HUS), across the EU; there were 53 confirmed deaths, 51 occurring in Germany and none in Spain; Spain registered only one official HUS case.

In addition to the suspicions of EHEC/HUS cases during the crisis, there were also measureable impacts to the Spanish economy, which some argue to have reached 100 million Euros in terms of social and economic losses for Spain in general and farmers in particular (Jofre & Mujeriego, 2012). The most evident sign of this were the drops registered in cucumber exports and imports, which reached their highest between May-July 2011, in comparison with the previous years and with 2012. Moreover, July 2011 registered the lowest number of exports in 5 years (762). This can be seen in the figures below.

[Insert Figure 1 and 2 about here]

### *1.3.3 Social media usage and communication*

According to the Eurostat Report 66/2011 “Internet use in households and by individuals in 2011”, 73% of the European population (EU27) had access to the internet



in 2011, with 64% access in Spain. 48% of Europeans and 54% of the Spanish citizens used the internet to obtain information from public authorities websites; 28% of Europeans and 25% of the Spanish citizens used the internet to submit completed official forms to public authorities websites; 58% of Europeans and 39% of the Spanish citizens used the internet to order goods or services for private use. With regard to social media use, the standard Eurobarometer N.36 of 2011 stated that 35% of Europeans were using social networks at least once a week, with 44% never using it, while almost 20% used it on a daily basis. The countries with the highest rate of social network use were the Netherlands (56% at least once a week), Latvia (55%), Denmark (54%) and Sweden (54%); the ones with the lowest use were Germany (27%), Portugal (24%) and Romania (22%).

Specifically with regard to Spain and the use of Twitter, a survey performed in 2011 by Telefonica (the state-owned telephone company), that included 1569 Spanish internet users (Telefonica, 2012), showed that Facebook, Tuenti and Twitter were at the top of social media channels used. Although Twitter was used by an average of 7.3% in the previous years, this dropped to 3.6% in 2011. In addition, Twitter was seen more as a complement to other social media channels, with 53% of Twitter users having three or more social media channels (with the most frequent combination being Facebook, Tuenti and Twitter). Of these Twitter users, 12.20% were permanently connected, with 26% using it on mobile devices.

This use of social media channels by individuals differs somewhat when compared to that of organizations which are responsible for providing information on food risks, both in crisis and non-crisis situations. A study by the FoodRisC project (FoodRisC, 2013) assessed 31 organizations in this area — including Food Safety Authorities, Consumer Organizations, as well as other types of organizations —,

between October 2012 and January 2013 in nine member states: Belgium, Germany, Ireland, Italy, Latvia, the Netherlands, Portugal, Spain and the United Kingdom. It was shown that 25 of the 31 organizations (80.6%) had at least one active social media account, whose main goal was to act as a two-way means of mass communication. The most used social media channels were Facebook and Twitter (54.83% each). While the former was mostly used to receive consumers' questions, and secondarily to provide information, the latter was mostly used to provide information directly to consumers, and less frequently to interact/engage with them. YouTube was also one of the top three channels used (48.30%), mostly to communicate content.

Although there are differences in usage between individuals and organizations, they seem to follow a similar pattern, as they use three or more social media accounts to communicate, all of them complementing each other. Both groups frequently use the same social media channels, mostly to interact, communicate, share, and search for information. It should be noted, however, that social media usage — and particularly Twitter use — may depend on the occurrence of a crisis. In accordance, reports refer that people increasingly look to the internet as a source of information in times of crisis (Google, 2011), and that organizations who communicate food risks increase their communication activities during these times (FoodRisC, 2013).

## **2. Method**

### **2.1. Data**

Social media data was extracted for Spain, during a 90-day period lasting from May 12<sup>th</sup> 2011 to August 12<sup>th</sup> 2011<sup>1</sup>. Spain was chosen due to the fact that, in the

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<sup>1</sup> The selection of this time range enabled us to analyse mentions before the first news about the EHEC crisis, and until after it officially ended — and also before RKI started examining the outbreak (May 20<sup>th</sup>), before the news came out (BVL, BfR, RKI, 2011).

beginning of the outbreak, it was considered to be the country of origin of the EHEC issue, due to contaminated cucumbers, which was dismissed some days later. The initial sample was comprised of 20 238 EHEC/E. Coli references, collected from various social media channels including: YouTube, forums and online news comments, Facebook posts, blog posts, and Twitter messages. This sample represented all the messages produced during that time interval, with at least one EHEC/E. Coli reference within the geographical area of Spain, in the Spanish language. This does not, however, represent all the social media messages produced at the time (i.e. the population of the messages), but a subset (i.e. a sample of the messages) of those, selected based on the parameters and criteria used for extraction (see procedure below). No daily limits for extraction were imposed, other than these parameters.

From the set of social media references, only Twitter references were analysed, representing a total number of 11 411 tweets. Out of this total, 43.3% of the mentions in the dataset were retweets (i.e. the same message tweeted by different sources<sup>2</sup>), while 3% were duplicated (i.e. the same message tweeted by the same source more than once per day<sup>3</sup>).

## 2.2 Procedure

The procedure followed in this study included the following steps: 1) identification of the theme upon its emergence in the first hazard notifications — EHEC crisis —, as well as possible keywords associated with it; 2) data tracking; 3) data preparation and “cleaning”; and 4) coping analysis (for a similar procedure see Stieglitz & Krüger, 2011).

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<sup>2</sup> The number of tweets was higher than this, given that many messages were clearly copy/paste messages from other sources. Still, for descriptive purposes, we only consider here the “official” retweets (RT).

<sup>3</sup> Given the low percentage of these cases in the extracted data, these were not excluded, given that their impact over the average number of tweets was not expected to be significant.

With regard to the first step, keywords associated with EHEC were identified, following its discussion with an expert panel. These included: VTEC; Verocytotoxin Escherichia coli; Verotoxin; STEC; Shiga toxin; EHEC; Enterohaemorrhagic E. Coli; TTP; thrombotic thrombocytopenic purpura; Escherichia coli; HUS; Haemolytic Uraemic Syndrome; Acute kidney failure; Acute renal failure; Bloody diarrhoea; strain/serotype O104; Pathogen; Zoonoses; Zoonotic disease. The selection of these keywords implies that Twitter users that did not use them were excluded. This could occur because of lack of knowledge, for being unaware of them, or simply by choosing not to use them. Thus, in order to reduce this, the keywords included not only references to the outbreak source and what were expected to be the “central hashtags” — EHEC, VTEC, STEC, etc. (communicated in the media and by the authorities) —, but also words that were expected to be associated with them, such as health symptoms (e.g. bloody diarrhoea; acute kidney failure) and general categories of biological contamination (e.g. Zoonoses). Finally, the list of keywords also included “E. Coli”, as it was known to be the lay term used in describing food contaminated with the EHEC bacteria. This tracking was based on these words, regardless of them being hashtags or not, as basing the data extraction only on the latter has provided a very limited set of data in crisis situations (see Bruns & Liang, 2012).

Tracking and data extraction was performed by Radian6 — a social media monitoring and analysis platform<sup>4</sup>. In this tracking process, the extraction of data at the country level was based on a set of criteria (in decreasing order of preference): 1) Geographical information as indicated on the author’s profile<sup>5</sup>; 2) Geographic

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<sup>4</sup> Based on a comparison between different social media monitoring platforms, Radian6 was selected due to its higher tracking volume, including all RSS feeds, a large number of blogs and Facebook public posts and access to 100% of Twitter’s active accounts (public).

<sup>5</sup> Due to the limitations of considering this information (see Bruns & Liang, 2012), additional criteria were considered in order to determine the extraction of data per country.

coordinates for posts sent via a geo-enabled device (e.g. mobile phone) or the top level domain (e.g. websites ending in .uk = United Kingdom). If the former information was not available, then 3) IP address (where the server is hosted); 4) Post language (Spanish language = Spain), based on natural language processing techniques to determine languages for posts<sup>6</sup>. The use of these extraction criteria may have imposed limits on the number of messages collected, as it excludes, for example, Spanish citizens that tweeted in languages other than Spanish (e.g. English). However, this was to assure that tweets from other geographical areas within or outside Europe (e.g. Latin America or the USA.) would not be collected. During tracking, no private data was accessed — only that available on public profiles.

For the data preparation and cleaning process, as well as the subsequent coping analysis, the following procedure was used:

### *2.2.1 Frequency of EHEC/E. Coli mentions*

In order to enable a subsequent quantitative analysis, the EHEC/E. Coli-related words and the two main foods (cucumber; sprouts) mentioned during the hazard sequence were identified. For each keyword, variations of the same word stem (singular vs. plural; misspelled words; etc.) were aggregated into a single word. This facilitated the subsequent analysis, thus concentrating only on the two products referred and the contaminant/hazard. Words were thus considered as the unit of analysis; their frequency and their co-occurrence with hazard notifications produced by official food safety authorities were used to describe the selected time period. For this quantitative analysis, we considered the 11 411 tweets taken from the set of 20 238 EHEC social media

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<sup>6</sup> If language was not detectable for a post (e.g. post is too short), historical content from the same author was taken into account for language determination.

references extracted during the during the 90-day period spanning from May 12<sup>th</sup> 2011 to August 12<sup>th</sup> 2011.

### *2.2.2 Content analysis*

In order to perform a qualitative analysis of coping expressions on Twitter, we selected a smaller period, between May 23<sup>rd</sup> and June 9<sup>th</sup>, than the one initially considered (May 12<sup>th</sup> 2011 to August 12<sup>th</sup> 2011). This represented the period that was relevant to test the hypothesis under study, namely the interval between the first hazard notifications and references on social and traditional media, alluding to Spain as the source of the outbreak, and the day (June 10<sup>th</sup>) in which it was disconfirmed, as it was confirmed that vegetable sprouts from the German region of Lower-Saxony were the source of the EHEC outbreak. Although there were suspicions that the source could be in Germany and not Spain, which were expressed before the 10<sup>th</sup> of June, this fact was only confirmed on this date, with an official lifting of the warning on eating cucumbers (and raw lettuce and tomatoes).

From the 10 656 tweets produced during this time, we excluded: tweet duplications (the same tweet published more than twice per day), retweets (without comments inserted in them<sup>7</sup>) and tweets that were not from individuals (e.g. news agencies). This allowed us to focus on individual messages (also including the retweets, whenever inserted comments were found in them) during the hazard sequence, which can be taken to reflect the crisis at an individual level. Based on this “data cleaning” process, we reduced the data set of tweets to a sample of 2099 tweets, which were the ones used in the qualitative content analysis.

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<sup>7</sup> Tweets not classified as RT, but which corresponded to a full quote from another source (i.e. copied), were also categorized by us as retweets.

For this analysis we considered the tweet as the unit of analysis, rather than the word and/or aggregation of words. These tweets were then coded in a number of categories based on a content analysis. However, in contrast to data-driven approaches to content analysis (see e.g. Chew & Eysenbach, 2010; Vieweg et al., 2010), our study included a data-driven approach. In our view, this would allow a deeper understanding of the psychosocial processes that take place during crises.

For the theory-driven approach, we used the classification of families of coping by Skinner et al. (2003). This lists 12 higher-order categories or families of coping: Self-reliance, Support seeking, Problem solving, Information seeking, Accommodation, Negotiation, Delegation, Isolation, Helplessness, Escape, Submission, and Opposition. These families are organised around three dimensions: (i) Three classes of perceived concerns that trigger responses: relatedness, competence, and autonomy; (ii) Two types of framing for these concerns: challenges (implying appraisal of opportunities for control) or threats (focusing on barriers to control); (iii) Two targets of coping: self or context. The intersection between these three dimensions allows the identification of each of the 12 families and the corresponding coping instances. For example, “Comfort seeking” and “help seeking” are two examples of ways of coping from the “Support seeking” family, which represents a response considered as a challenge, focused on the context and addressing a concern associated with relatedness. The same type of way of coping framed as a threat would be “Withdrawal”, in the Isolation family (for more examples, please refer to table 2). Drawing on these families and on coping expressions found in health-related literature, we identified examples that correspond to each one of them in a food crisis context. This served as a basis for the coding script, which also included an additional category (13) to code the tweets in which the coping that was being expressed was either not clear or did not express coping at all.

The complete list of tweets was separately coded — individually and manually — by two independent coders, after an initial training in the coding scheme, in which they coded a sample of tweets. The inter-rater agreement (Cohen's Kappa) was high ( $k = .86$ ;  $SE = .008$ ). Subsequently, the coders met again to recode the complete list together and all disparities were resolved<sup>8</sup>. Tweets that both coders rated as 13 (unclear coding) were excluded from the analysis, arriving at a final number of 1688 tweets.

Afterwards, a frequency analysis was performed for the tweet subset, included in the content analysis. This aimed to assess differences in expressed ways of coping, based on certainty about the contaminated product source. This implied comparing the period in which the hazard notifications communicated that there was certainty that Spanish cucumbers were to blame for the outbreak (May 23-31) with the period in which there was uncertainty about which product(s) was (were) to blame for the outbreak (May 31<sup>st</sup> till June 9<sup>th</sup>). The latter period also included the first suspicions that vegetable sprouts were to blame, which was confirmed (certainty) on June 10<sup>th</sup>.

[Insert Table 2 about here]

### 3. Results

#### 3.1. Hazard mentions

The number of tweets mentioning the keyword EHEC in Spain from May to August 2011 was 11 411, with 2287 mentions of cucumber, 3210 mentions of sprouts and 467 mentions of both cucumbers and sprouts in the same tweet. The latter mostly referring to a transition between the certainty period (cucumber identified as the

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<sup>8</sup> Including cases in which tweets were coded as 13 (unclear coping) by one of the coders.



contaminated product) and the uncertainty period (uncertainty about contaminated product and first suspicions regarding sprouts, before the official confirmation).

Specifically considering the hazard mentions that co-occurred with the EHEC outbreak timeline, frequency analysis showed that discourse peaks matched the hazard notifications produced (see Figure 3). In the period between May 26-30<sup>th</sup> (n=319), for example, media reported the link between Spanish cucumbers and the EHEC outbreak. In accordance, the EHEC references continuously increased, reaching their peak between May 31<sup>st</sup> (n=1370) and June 1<sup>st</sup>, when the German Federal Institute for Risk Assessment (BfR, 2011a) released a statement with the headline “*EHEC pathogen not yet typed: tomatoes, cucumbers, and salads should nonetheless continue not to be consumed raw*”. June 1<sup>st</sup> (n = 449) was a turning point, since the BfR eliminated the link between Spanish cucumbers and the EHEC outbreak by releasing a press statement: “*EHEC germs on Spanish cucumbers do not correspond to the pathogen type of the patients concerned*” (BfR, 2011b). The highest peak in EHEC mentions (see Figure 3) occurred when suspicion was raised with regard to sprouts being the source of the contamination (June 5<sup>th</sup>, n=1859), namely in a press conference held in Hannover, which established a link between patients and the consumption of sprouts from an organic farm in Uelzen, South of Hamburg. Another smaller peak occurred when sprouts were confirmed as the contamination source (n=566) (BfR, 2011c), followed by another peak, between June 15<sup>th</sup> and 16<sup>th</sup>, when there was a French EHEC outbreak (n=367).

[Insert Figure 3 about here]

### 3.2 Variety of coping expressions

Based on a qualitative content analysis using the tweet as the unit of analysis, coping instances expressing ways of coping (e.g. help seeking) were identified within each family of coping (e.g. support seeking). In order to facilitate the description of the results, these were divided into two higher-order categories with regard to levels of distress and whether the target of coping is the self or the context: Challenges to self or context (implying appraisal of opportunities for control) vs. Threats<sup>9</sup> to self or context (implying appraisal of barriers for control). It should be noted, however, that by considering the tweet as the unit of analysis, more than one way of coping can be expressed in it. Nevertheless, in the majority of cases, this did not happen. In the ones that did, the coders focused on the way of coping that was more clearly expressed.

Table 3 below shows that the majority of the ways of coping mentioned in the tweets refer to challenges (55.8%), and particularly to context-related challenges (30% vs. 26% self-related). On the other hand, the threats (44.2%) were dominated by self-references (25% vs. 19% to context). This result can indicate that the crisis was mainly viewed by the tweeter as a challenge to the context and not so much as a threat to the self. Regarding the 12 families of coping, *isolation* was expressed the least (1.3%), followed by *self-reliance* (2.4%) and *problem-solving* (2.6%). Differently, *accommodation* (20.5%), *information seeking* (17.1%) and *opposition* (16.9%) were the most expressed ways of coping. Relevant examples of these will be described next.

[Insert Table 3 about here]

### 3.2.1 Challenges to context

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<sup>9</sup> To avoid confusion, it should be noted that threat here refers to a threat to control (being able to cope).

Twitter expressions of coping drawing on resources from the context resulting from opportunities to control were the most common (30.28%) of the four groups considered (challenges vs. threats; self vs. other). They included the implementation of a wide diversity of information seeking (17.12%) and support seeking (9.66%) ways of coping (see examples in table 4 below). Less variability and diversity were found for the expression of *negotiation* (3.5%). Examples of *support seeking* mostly referred to close family or peers, framed as behavioural expressions of help seeking. This involved either requesting specific information, for example, about the source of the threat, health consequences, relationship/associations with other products (e.g. between E. Coli and the bacteria found in yoghurt, such as L. Casei), or requests of general comments and discussion of crisis-related issues (e.g. connection with Influenza A and other crises). Some examples of behavioural expressions of comfort seeking were also found, but these were less heterogeneous, mostly focusing on close friends. Although sometimes implicit in instances of help seeking, no explicit examples of emotional expressions of trust in others were found. Regarding *information seeking*, the majority of coping instances referred to individuals' behavioural expressions of study and observation of the context. This was mainly related to information about the origin of the hazard and what the contaminated product was. Observation was expressed more as a coping instance than “study” was, thus evidencing individuals' awareness of events, news, etc., by means of reading, hearing the news, watching documentaries (e.g. various references to the “Food Inc.” documentary) and other forms of information. Various examples of *negotiation* were also found, with these referring mostly to emotional expressions of blamelessness — stating that the cucumber and/or Spain were not to blame for the outbreak —, as well as taking the perspective of others, mostly referring to Spanish

farmers. A few expressions of the latter were also found for German farmers and Japan, the latter being where an E. Coli outbreak was also detected.

[Insert Table 4 about here]

### 3.2.2 *Challenges to self*

Twitter expressions of coping drawing on resources from the individual (self) resulting from opportunities to control demonstrated an overall tendency to approach the problem, and accounted for 25.54% of the tweets (see table 5). The most common type of family of coping in this higher-order category of challenges to the self referred to *accommodation* (20.5%). This was the category in which more variety and heterogeneity of ways of coping and coping instances were found. Many examples were found of distraction from the threat through the use of humour and jokes, thus implying an emotional expression of acceptance of the threat and a positive adaptation to it. This clearly depended on the contaminated product, as much of the humour alluded to cucumbers and not sprouts. Many tweets implicitly associated cucumbers with sexual references which, after suspicions were raised for sprouts in Germany as the source of contamination, included Germans as the target of the joke. Other uses of humour implied the association of cucumber with known movies and other cultural references — for example, a very popular hashtag at the time was #pelispepineras. Other uses of humour focused on German politicians (Angela Merkel) or Spanish politicians (Mariano Rajoy) as their target, thus representing a positive adaptation to the threat. Reference to other families of coping was much less frequent. *Self-reliance* (when the individual accepts his responsibility in coping with the threat, expresses concern for others, implements self-soothing and shouldering, 2.43%) referred mainly to emotional

expressions of concern for others and behavioural expressions of shouldering, namely through behaviour regulation (e.g. thinking about the best thing that a person could do). Very few examples were found for emotional expressions of accepting responsibility for the threat, and none for self-soothing. As for *problem solving* (2.61%), the majority of tweets referred to behavioural expressions of strategizing, i.e. people referring to the actions they could take/had taken to control the threat, most frequently with regard to washing the food products. In addition, it was in this category of coping that many cases were found in which more than one way of coping was expressed in the same tweet. This occurred for emotional expressions of determination or confidence, which in most cases co-occurred with behavioural expressions of strategizing (see examples in table 5 below). Surprisingly, the latter occurred often without being associated with the former.

[Insert Table 5 about here]

### 3.2.3 Threats to context

25.23% of Twitter expressions of coping drawing on resources from the context resulting from barriers to control mostly had to do with the implementation of a wide diversity of *opposition* (16.88%) and *escape* (7.05%) ways of coping (see examples in table 6 below). Much less variability and diversity was found for the expression of *isolation* (1.3%), which, out of the twelve, was the least expressed way of coping, including **behavioural expressions of freeze**, as well as emotional expressions of loneliness and desolation. No examples of behavioural expressions of withdrawal and emotional expressions of yearning were found. In a different way, a wider variety of expressions of *escape* was found, related to behavioural expressions of avoidance and emotional expressions of pessimism and fear. Moreover, there was also a variety of

ways of coping relating to avoidance, which included cognitively escaping the situation by denying it (e.g. mentioning that this was an “unnecessary alarm”), or behaviourally escaping it, by not buying and consuming food products. This behavioural avoidance was predominant, initially referring to cucumbers and subsequently to sprouts, with more cases alluding to the former than the latter. Pessimism was expressed in a more homogeneous way, with several references to the situation possibly worsening, after it was communicated that cucumbers were not to blame, and when there were more suspicions that sprouts were also not to blame. Finally, with regard to *opposition*, there was heterogeneity in the ways in which it was expressed, including behavioural expressions of aggression on one side, and emotional expressions related to the assignment of blame to others, venting, “explosion”, and anger on the other. Out of all the 12 ways of coping, this was the one in which more variety was observed. This included either more “passive” ways of aggression that represented offensive language and sarcasm (showing reactance and revenge), or more “active” expressions, including physical threats and threatening behaviour with a damaging intent (e.g. boycotting German products, to damage their economy). Emotional expressions of coping were also identified. Blaming the Germans, for example, was much used after the confirmation that cucumbers and Spain were not to blame for the outbreak. In addition, many examples of anger were directed at them, and a few examples of venting and “explosion” were also found. Surprisingly, examples of projection were not found.

[Insert Table 6 about here]

### 3.2.4 *Threats to self*

Twitter expressions of coping drawing on resources from the individual (self) resulting from barriers to control were the least frequent of all the categories considered (18.95%). This shows that an overall threat avoidance tendency and/or asking others to do something about it (see examples in table 7 below) were not the main strategy in dealing with the crisis. Nevertheless, a wide variety of coping expressions with regard to *delegation* was found (10.66%), relating to behavioural expressions demanding the identification of the source of the threat or for compensations (either monetary or unspecified) to be made to Spain in general, or to Spanish farmers in particular. The former demands were also found in co-occurrence with behavioural expressions of dependency, namely referring to the period in which there was uncertainty about the source of the threat. Surprisingly, the latter were found more when Spain was confirmed as not being the origin of the outbreak, and with Germany being confirmed as its origin. No emotional expressions of this way of coping were found. In regard to *helplessness*, a few examples were found overall (4.32%), referring to emotional expressions of self-doubt and discouragement, but mostly to behavioural expressions of random attempts (individuals expressing that the alternatives available would not lead to successful coping or would not be effective). This was mainly related to which product could be consumed or bought, and not so much to actions focused on washing the product (as referred to in expressions of problem solving), for example. Reference to *submission* was not common (3.97%), and included a variety of behavioural expressions associated with perseveration, rigidity and unresponsiveness. Out of all of these, perseveration was preponderant, evidencing individuals' difficulty in changing their behaviour or thoughts about the contaminated source being cucumbers, even after that had been dismissed. The few examples of emotional expressions that were found referred to expressions of disgust with the situation.

[Insert Table 7 about here]

### 3.3 Coping expressions under uncertainty

With regard to the comparison between periods differing in terms of certainty (cucumber; May 23-31<sup>st</sup>) and uncertainty about the contaminated product (May 31<sup>st</sup>-June 9<sup>th</sup>), binomial test results showed a significantly higher proportion of coping expressions during the uncertainty period (77%), when compared with the certainty period (23%) (Binomial; two-tailed;  $p = .000$ ). Regarding the comparison of higher-order coping categories, results showed no significant differences between the expressions of coping with regard to self or to context, between the two periods. Regarding the comparison between expressions referring to challenges and threats, results showed a marginally non-significant difference (Fisher's exact test; two-tailed;  $p = .059$ ). Both challenge and threat expressions were higher during the uncertainty period, with threats being expressed more than challenges during the latter. In addition, more threat-related expressions (80%) and less challenge-related expressions (76.1%) were produced during the uncertainty period. Surprisingly, less threat-related expressions (20%) and more challenge-related expressions (23.9%) were produced during the certainty period.

Chi-squared results for the comparison of the 12 families of coping between the two periods showed that *submission* was more frequently referred to during the uncertainty period; on the other hand, *negotiation* and *escape* were less frequent during the uncertainty period, as compared to the certainty period,  $\chi^2(1688, 11) = 33.184$ ;  $p = .000$ <sup>10</sup>. In addition, observed values for *opposition* and *problem solving* were marginally

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<sup>10</sup> Adjusted standardized residual values above or below  $\pm 1.96$  (Agresti, 2002) indicated that the observed values were significantly higher or lower than expected, respectively.



non-significantly (adjusted standardised residual value of  $\pm 1.90$ ) higher or lower than expected, respectively, in the former period. No differences were found for other families of coping.

[Insert Table 8 about here]

#### **4. Discussion**

This study aimed to perform a psychosocial media analysis of the way people deal with a food crisis. On one side, it aimed to give examples of the diversity of coping strategies that people may use to deal with a crisis, based on Twitter expressions evidencing their implementation. By doing this, we could identify manifestations that can be found in other crises, as well as others that may be specific of the way Spanish consumers reacted to it. In this sense, expressions of information seeking strategies can be expected to occur in most crises, given that people look to the internet as a source of information in times of crisis (Google, 2011) and that organizations actively and regularly provide information about these crises, during these times (FoodRisC, 2013). However, this also relies heavily on information that is available with regard to the threat (or health consequences, etc.), which may be absent or reduced. For example, in the Spanish case, there was an initial certainty that cucumbers were the source of the outbreak. This was followed by uncertainty about which product was affected. This uncertainty led to more expressions of avoidance in terms of buying/consuming products (cucumbers, vegetables), when compared to when people had access to information about which the affected product was. This information would allow for problem solving strategies to be applied, for example, by properly washing the product that had been identified as being affected.

Apart from coping strategies that may or may not be implemented based on the available information and other situational factors (i.e. available social resources), there were coping expressions identified in this study that can be considered specific to the Spanish situation. A clear example of this would be the use of *opposition* coping strategies, namely associated with anger towards Germany, blaming Germany for false accusations, and “explosive” reactions associated with it. This was also the case for expressions of *delegation*, namely expressed through demands for the identification of the threat source and compensations to Spain (e.g. Spanish farmers), after it had been found that Spanish cucumbers were not associated with the outbreak. These two types of coping strategies were specific to the Spanish case, and thus may only be found in crises with similar characteristics (templates) and events taking place.

What was crisis-specific and what can be found across crises everywhere is a question that requires further studies to be answered. Nevertheless, the Spanish case, during the 2011 EHEC crisis, sheds some light into it. Based on this, the results show a diversity of coping strategies that were expressed during the crisis in Spain, which may be expressed in other crises with similar characteristics/templates. Moreover, they also showed Spain’s situation during the crisis, and allowed to summarize expressions that were specific to it, namely associated with uncertainty regarding which product was affected, as well as the initial associated accusations that were subsequently dismissed. These general and specific aspects will be discussed next.

#### 4.1 Coping diversity

With regard to our first research question — *What ways of coping are expressed during a food crisis?* —, the results of the qualitative content analysis showed, first of all, that evidence of coping strategies during a food crisis can be observed on Twitter.

Although this had been foreseen in studies regarding other health-related crises (such as pandemics, for example, Signorini et al., 2011), it has not been explicitly done for social media and for Twitter in particular, with regard to food-related crises. For this reason, this study represents the first example of “crisis informatics” applied to a food crisis (Palen, 2008). Secondly, results showed that people creatively deal with crises, using coping *flexibly*, by implementing it not only based on a wide variety of families of coping and ways of coping, but also on different instances of the same way of coping. For example, the most frequent way of coping in our study — accommodation —, in which people expressed acceptance and showed a positive adaptation to the crisis, included a wide variety of coping instances, one being humour. The same occurred with opposition, with various forms of anger being expressed. Interestingly, this dynamism was also shown by different people using the same target — Angela Merkel or the Germans — both in a positive (accommodation) and negative (opposition) way. Thirdly, there was evidence that people are *active observers* of the events that occur in their psychosocial environment. This was the case, for example, in their use of strategizing: knowledge of the actions to take (e.g. wash raw vegetables) was clear in their expressions, mirroring the advice given by food safety authorities at the time. The use of information seeking also showed this, as most of the expressions referred mainly to passive information seeking, i.e. observation of the events and information provided, rather than actively searching for it. Fourth: results showed that people use ways of coping in a *dynamic* way, by referring to more than one way of coping at a time. This was the case, for example, of emotional expressions of determination and confidence, which co-occurred often with behavioural expressions of strategizing. Similarly, co-occurrence of behavioural expressions of dependency and demanding was found. In addition, people in the sample of tweets analysed resorted to expressions referring to

challenges and to threats (to self and context) in similar proportions, thus showing the variety of uses coping can have. Lastly, people demonstrated that they were *social beings*, given that there was evidence in their expressions of referring not only to individual resources, but also to resources drawn from context. This was evident, for example, in the use of support seeking and information seeking. The latter way of coping was actually one of the most expressed on Twitter, and clearly depended on the information provided by authorities, with regard to the contamination source, its origin, and advised actions. Moreover, the use of opposition, one of the most expressed ways of coping, also clearly depended on the context, as it mainly referred to the confirmation that Spain was not to blame for the outbreak. Interestingly, however, the proportion of expressions with regard to the self and to the context was similar. Again, this might be an indication of dynamism, showing that people can equally draw on themselves or the context, depending on the demands posed by the events that occur over time. All of this is in line with existing coping literature, showing that people observe their surrounding environment, in order to adapt to changing demands (at the individual and social level), using a wide array of ways of coping (Skinner et al., 2003).

#### 4.2 Coping under uncertainty

With regard to our second research question — *is there any relationship between the uncertainty expressed in hazard notifications and the ways of coping?* —, the results did not show clear changes in higher-order categories of coping (self vs. context; challenge vs. threat) as expected. Nevertheless, there was a pattern showing slightly more expressions related to threat than to challenge, during the uncertainty period, in accordance with what was expected. In our view, this pertains to the fact that uncertainty can increase risk perception and the level of distress experienced (Miles &

Frewer, 2003). This distress, in turn, implies more coping strategies associated with a threat to the self and context (Skinner et al., 2003). Nevertheless, this might indicate that higher-order categories of coping are not adequate when it comes to analysing and monitoring crisis situations. This is because they do not seem to be sensitive to contextual changes, instead showing general patterns of human behaviour that are not context or stressor specific (as evidenced by the similar proportions of these categories found).

These results became clearer when differences between certainty and uncertainty periods were analysed with regard to the 12 families of coping. On one side, opposition and submission increased under uncertainty. The increase in opposition was associated with the confirmation that cucumbers were not to blame for the EHEC outbreak (thus initiating an uncertainty period, with regard to the contaminated product and its origin). This implied, for example, emotional expressions of blame attributed to Germany, anger over the unproven accusations against Spain, and expressions of physical aggression and verbal offence directed at Germany, the Germans and/or politicians. Thus, the content of these coping expressions clearly showed that they changed based on hazard notifications, which produced changes in the context of the crisis. Surprisingly, the increase in expressions of submission seems to indicate that, for some people, the confirmation that cucumbers were not to blame for the outbreak might not have altered their beliefs about the threat. Under this scenario, uncertainty might actually have contributed to maintaining or even reinforcing perseverance and rigidity. This is because the notifications also confirmed that the hazard remained the same (E. Coli bacteria in food), although the risk target changed (from cucumber eventually to vegetable sprouts). This was shown in the content of the tweets, in which many did not make a reference to cucumber but rather to E. Coli. Also, other tweets referred to more

general categories of contaminated products (vegetables; raw vegetables; salad products), rather than mentioning cucumber, an example of those categories. Consequently, a change in one example would not make a difference, as other examples of the same category could also be affected, through cognitive association (see e.g. Rozin, 2001). This was in fact the case in some tweets, in which lettuce and tomatoes were also referenced.

Surprisingly, negotiation, escape, and problem solving families of coping were more frequent during the certainty period. As before, this indicates that there was a variation, which coincided with the hazard notification referring to cucumber not being the contaminated product, as well as the origin not being Spain, but rather Germany. In this first period, it was adaptive to use problem solving and escape strategies with a problem-focused orientation (Lazarus & Folkman, 1984). These aimed at directly managing or regulating the cause of distress, for example, by avoiding (escape: e.g. stop buying a product; denial; etc.) or approaching it (problem solving: e.g. washing a contaminated product; cooking it; etc.). While it was initially adaptive, it ceased to be so, after there was no need to act upon the threat, due to it “moving” from Spain to Germany, and “away” from Spanish cucumbers. In addition, negotiation involved many expressions of blamelessness during the certainty period, which — based on the content of the tweets — changed to expressions of blame throughout the uncertainty period, reducing the negotiation during this period. Aside from all this, we expected information seeking strategies to increase under uncertainty, given that the absence of information could actually motivate people to search for it. However, this was not the case. In our view, this was because many of these expressions were made in the form of demands (for information about the contaminated products and origin of contamination), thus being part of the delegation family of coping. In addition,

information search can also be implemented through support seeking, therefore “dispersing” information search through other families of coping.

#### 4.3 Methodological limitations and opportunities

People’s expressions of their coping actions (e.g. buying or not buying the affected product), along with their emotional and cognitive expressions on Twitter, were used as a proxy to their actual coping during the food crisis. This is because this data had the advantage of providing access to real-time spontaneous reactions to the events and hazard sequence, through small units of analysis, over a long period of time, and for a large number of people. Thus, rather than studying the outcomes of the crisis based on a post-event assessment, this crisis was analysed before, during, and after the key events and major hazard notifications had occurred.

It should be noted, however, that, although we excluded retweets from the analysis, for the reasons mentioned in the methodology section, these should be taken into account in future studies. This is because it has been shown that the act of retweeting may partly result from the affective content of the message (Stieglitz & Dang-Xuan, 2012). Thus, the affective coping expression of one individual may elicit affective or other types of reactions from another individual, which makes them an important aspect to take into consideration during crises.

Despite this, we think that these results show the potential of using social media for preventative surveillance of food-related threats (Newkirk et al., 2012), as this can include the monitoring of coping instances, and the identification of the ways of coping expressed. However, although using the tweet as the unit of analysis affords a methodological advantage, by allowing qualitative social media analysis, at the same time, this represents a time-consuming task which is virtually impossible in large data

sets (i.e. millions of tweets). Nevertheless, an increase in the data collected with studies following this qualitative analysis approach can be the basis for the development of standardized criteria for the identification of coping expressions, following more quantitative and computer-based approaches.

In addition to limitations imposed by a qualitative analysis and the choice of the tweet as the unit of analysis, other limitations imply that care should be taken in the interpretation of results with regard to coping expressions. For one, we should take into account the fact that it is difficult to access individual characteristics from Twitter, such as, for example, psychosocial (attitudes, knowledge, perceived self-efficacy in dealing with threats; ...), socio-demographic (gender; ...) and/or socioeconomic (income level, ...) characteristics. In this sense, tweets may not represent the population in general, taking into consideration these characteristics, and may not even represent internet users themselves (Boyd & Crawford, 2012). Nevertheless, these analyses should always be seen as part of a multimethod approach, and validated with other related data sources (see e.g. Culotta, 2010). Moreover, the goal may not be to represent the views of the population. The goal may be, as in our paper, to have a detailed analysis of the context (social and self) in which coping is expressed, and the diversity of coping instances in this regard, rather than the preponderance of views in the larger population, during a crisis situation. Depending on the research goals, this may or may not be a limitation.

Another limitation of analysing Twitter data to study coping is the existence of duplication within and between profiles — i.e. messages produced by the same person with the same or similar content more than once vs. retweets (retweets not identified as such but that are copy/pasted from other people). This can over-represent the results or the coping strategies expressed and, as such, a thorough process of data cleaning had to be implemented. This also included the exclusion of data from groups/organizations,



given that the goal was to analyse only individuals' expressions. On Twitter, it is sometimes difficult to differentiate between individuals and organizations, which makes the process time-demanding in this regard. Apart from these, other limitations can also be present (see Boyd & Crawford, 2012 for a review), although, as previously mentioned, they substantially vary depending on the research goal.

#### 4.4 Conceptual limitations and opportunities

Conceptually, the data had the advantage of providing access to an individual level of perception, in order to fully understand the psychosocial processes involved in the coping process. Still, given that individuals can draw both on their own resources and the resources in the surrounding context (social), in order to cope, this also provided access to a social level of coping. Nevertheless, Twitter itself as a communication channel might be a limitation to the expression of certain coping strategies, and a facilitator of other ones. For example, expressions of *isolation* imply withdrawal from the social context and feelings of loneliness. Although this can motivate people to communicate and express social support on Twitter, for example, it can also inhibit them from doing so. At the same time, the possibility of replying and retweeting can facilitate social support and information seeking strategies. This is inevitably associated with the use of Twitter and should therefore be taken into consideration when interpreting results.

Apart from this, it should be noted that coping expressions are dependent on the specific threat/stressor/event, as well as situational characteristics (e.g. constraints to action) and demands. However, our goal was not to generalise to health and food-related crises, but rather to show this dependence on the context. Nevertheless, while the specific expressions and coping instances might vary in their quantity and quality across

a crisis, in our view, this refers to variations of the use of the same families of coping. For example, the expressions of opposition using Germany, the Germans, and/or politicians as targets seemed to characterise the EHEC crisis, and might not be expected in other crises, unless a similar event occurs. In the same way, the use of accommodation based on humour with cucumber as a target seems product-specific. Thus, it is less probable that it should be generalized to other food products, in crisis situations, unless they are somewhat perceived as being associated (Rozin, 2001). In addition, these coping expressions might be country-specific, as different strategies might have been expected, according to which country was reported as the origin of the outbreak. Accordingly, different expressions could have been expected for Germany, in comparison with Spain. This is because Germany was only subsequently identified as the origin of the outbreak, although Spain had initially been identified as its origin; Germany, however, suffered the consequences.

Nevertheless, the fact that coping has situation-specific components is, at the same time, an advantage — as it allows for an adaptation of risk communication and interventions to the responses that people are implementing. For example, the identification of expressions of the opposition family of coping could have allowed for communication with the goal of conflict resolution, at the time of the outbreak. This could have allowed to move from the use of these strategies to more “positive” negotiation strategies that took into consideration others’ perspectives and which would imply compromise. As Skinner (2007; p. 246) refers, although coping pertains to individual actions, it “emerges from a system”, and thus “it is diagnostic of the entire coping system, of which the individual is just a part”. In accordance, analysing these individual strategies (as e.g. opposition) might be indicative of the processes that might be occurring at macro social levels.

Another aspect worth discussing is the way in which stressors — the target of coping — are conceived. In our study, we considered the stressor/threat as being related to the identification of the contaminated food product (source) and its origin. This was associated with hazard notifications, as well as related events that deviated from the norm, demanding non-routine organisational and individual responses. However, one can logically assume that another stressor referred to the economic threat, having an impact over agriculture, retail and others, and also threats to social identity, namely a negative image of the country, from the perspective of other countries. The data and the methods of analysis which were used make it difficult to clearly separate between consumption-related stressors and social identity and economic impacts. Nevertheless, this limitation is, at the same time, an advantage of this type of analysis, as this allows to assess people's responses to the events and changes that occur in their context. According to this view, people do not respond to each individual stressor, but to multiple stressors in their psychosocial environment (Evans et al., 1996). As multiple stressors can be present in continually changing contexts — and people's coping strategies are dynamic and adaptable to this —, psycho-social media analysis can capture this, by focusing both on the individuals and their context.

## **5. Implications to crisis communicators**

The importance of Twitter in times of a food crisis seems clear. One of the many advantages relates to the fact that Twitter facilitates the immediate transmission of important information to as many people as possible (Tinker & Fouse, 2009). Moreover, monitoring online conversations makes it possible to detect upcoming issues at an early stage of development, and to monitor on-going debates on hot topics such as health outbreaks, and so on. In our view, our study illustrated the importance of this, by

showing the variability and heterogeneity of ways in which people express their coping with threats related to food hazards — in this case, a biological contamination.

Accordingly, coping emerged as a dynamic, flexible, and social response that people have, when faced with multiple threats to themselves and others. By looking into these expressions, crisis communication can be made more effective. This can be achieved if communicators assess if people are using the most effective coping strategies for the specific threats that have risen, and the context in which they emerged.

Even when the sample assessed is not representative, as often is the case with social media data (see Bruns & Liang, 2012), this still allows the communicator to know what the various types of responses that can arise are, and thus devise different communication strategies adapted to this. For example, the identification of coping expressions of “opposition” (anger; blaming others; etc.) on Twitter as soon as a possible crisis is identified can function as an early warning that this may be expected in the general public. By knowing this, communicators can design their communication aimed at avoiding conflicts. Moreover, if data is collected at a later stage when the crisis is well established, then communication strategies can have the goal of conflict resolution. For example, the identified expressions of opposition — namely, blaming others — could be changed into expressions of negotiation, by taking into consideration other people’s perspectives and compromises. Thus, performing a psychosocial media analysis of Twitter data and other social media channels in which these expressions may also be obtained (e.g. Facebook; online comments to online media articles) may aid both in crisis prevention and crisis management.

Moreover, it has been shown that communication authorities use Twitter to provide information directly to consumers, but not so much to receive consumers’ questions and interact/engage with them. In a way, this is in line with people’s

motivations during the EHEC crisis in Spain, given that coping included expressions of information seeking (e.g. observing their surrounding context, studying/reading information about the threat). However, many other expressions of coping also included requests for information by other people — in the form of replies —, and/or other forms of social support with an affective basis. This may indicate that the potential that Twitter offers in allowing interaction/engagement with consumers is being dismissed by authorities, who prefer to concentrate on other social media channels for that (mainly, Facebook; FoodRisC, 2013). In this regard, rather than replacing the social support that is already characteristic of Twitter, communicators could complement it by providing support themselves, i.e. not only through information, but also through interactions with consumers to achieve an effective coping. Also, given that Twitter is characterized by quick spontaneous and affective reactions (see e.g. Thelwall, Buckley & Paltoglou, 2011), this interaction and engagement may allow for people to express their emotions, as a way of coping. Thus, rather than seeing the public's emotional reactions as something unwanted, given that these serve an adaptive function, they can actually be endorsed, accompanied by expressions of empathy from the communicators (EFSA, 2012). Likewise, given that behavioural dimensions of coping may also be expressed on Twitter, they may provide a proxy to the actual behaviour, at an initial stage of a crisis or during it. This can allow communicators to have a sense if consumers' actions are being effective in coping with the health threat or not (e.g. if people are doing what was advised by authorities or doing something different).

## **6. Final remarks**

Although this study focused on Spain, it also provided a view of coping expressions that may be found in other crises with similar characteristics/templates. In

accordance, studying one crisis, and understanding the psychosocial aspects that are associated with it, may allow for the understanding and prevention of others similar to it (e.g. in which the implementation of opposition strategies is expected).

Research into these aspects may also have implications other than for communicators. This can be a starting point in developing computer tools for crisis surveillance and prevention, which can complement already existing epidemiological monitoring procedures (Culotta, 2010). For this, more studies focused on how people perceive and cope with health crisis situations in general, and food crises in particular, are needed. These studies can allow the identification of the key factors that can be surveyed by these systems. In this regard, the analysis of coping seems very important. Knowing how people are coping with crisis could aid stakeholders in adapting communications to provide necessary information and warnings, while minimising psychological, economic, and other impacts.

Another important issue is the chronic aspect of crises. Although it was not the focus of our study, data from social media can also provide interesting insights. The use of some coping strategies, while being adaptive in certain situations and moments, might eventually become maladaptive in the long-run (Skinner et al, 2003). For example, the expression and implementation of coping strategies from the “*helplessness*” family implies that the person becomes conscious of his/her limits regarding the actions to take (“there is nothing I can do regarding this threat”). This is adaptive, when it is not possible to act. However, its use in the long-run and recurring lack of habituation to the threat over time (Lima, 2004) can be associated with the emergence of an array of health and psychological negative effects (Overcash et al., 1996). In this case, identifying the expression of this way of coping over time, through social media monitoring, could indicate that the threat(s) would be gaining chronic

properties. The fact that in our study helplessness was one of the least expressed families of coping might be indicative that, in Spain, this outbreak did not have the characteristics of a chronic crisis. For this to occur, various “ingredients” needed to be present (see e.g. Lazarus & Folkman, 1984), with the duration of the crisis being only one of them.

Often, in times of crisis, people are advised to change their behaviour and/or implement a new one. In this sense, analysing people’s coping strategies could aid in identifying if its implementation is being effective in reducing or eliminating the threat. Moreover, people’s behaviour may not only have a direct impact over their health and well-being, but also indirect impacts on other people’s behaviours, on economy, etc. This can occur, for example, when people do not implement the necessary precaution behaviours, and thus put their family at risk, or when many people stop buying a certain product or a category of products.

Our study aimed to show the various ways in which coping could be expressed during a crisis. This allowed us to build an argument in favour of its inclusion in the field of food crisis informatics and of adding a psychological level of explanation to social media analysis. In this regard, crises are not necessarily bad. They can present us with challenges and opportunities. And an opportunity has risen from the EHEC crisis: it made clear the need to further develop the field of psychosocial media analysis.

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Figure 1. Cucumber exports between April-September (2008-2012)

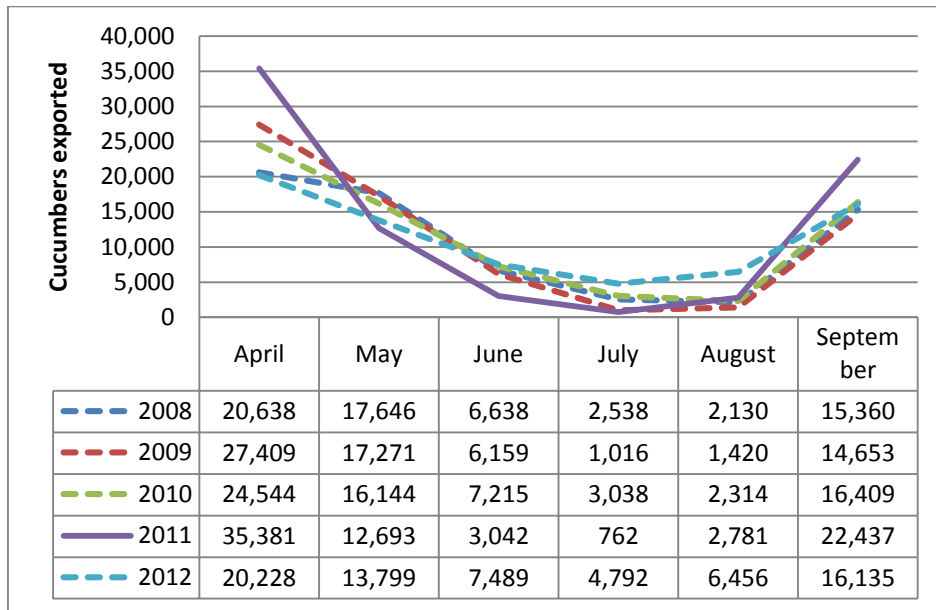


Figure 2. Frequencies of EHEC mentions in Spain

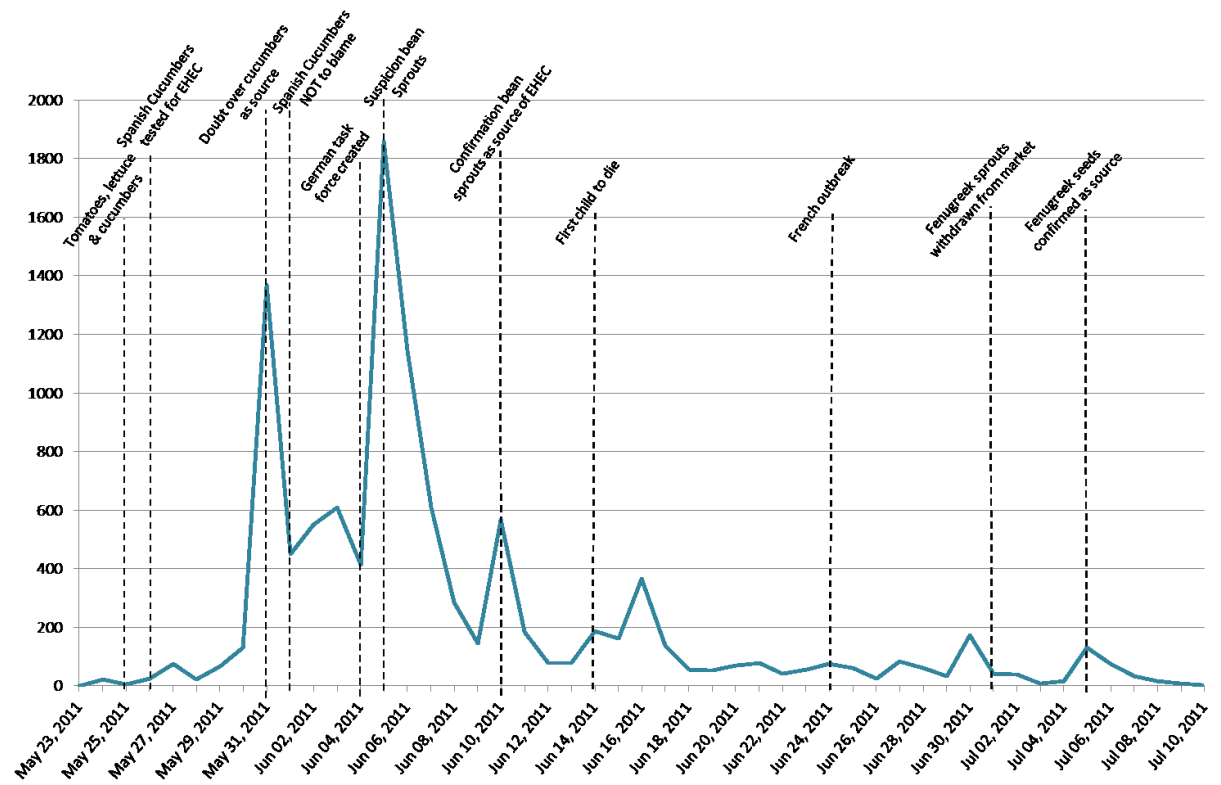


Table 1. EHEC Outbreak Timeline (FoodRisC, 2011)

11 May	First reported cases of human contamination from E. Coli (BVL; Clark, 2012).
19 May	Hamburg's chief medical officer asks the Koch Institute to investigate three cases in children. Further cases emerge in Northern Germany over the next 24 hours.
22 May	A significant increase in the number of patients with HUS and bloody diarrhoea caused by SHIGA toxin-producing E. Coli reported in Germany. European early warning response system alert sent out stating 30 cases of HUS in Germany.
24 May	German authorities report 3 suspected deaths from a strain of the E. Coli and warn more are likely because of a "scarily high" number of new infections;
25 May	Consumer Advice: German Authorities warn consumers to be especially careful when eating tomatoes, lettuce, and cucumbers in Northern Germany (BfR — The Federal Institute for Risk Assessment; European Food Safety Authority — EFSA).
26 May	Health authorities of Hamburg identify three cucumbers from Spain as the cause of the disease, along with a fourth whose origin is unknown. Cucumbers are believed to be responsible for the outbreak of food poisoning (Reuters).
27 May	Spain's agriculture minister says there is "no proof" it is to blame.
30 May	Some countries ban the import of vegetables from Spain and Germany (E.g. Russia) (ABS-CBN News)
31 May	Germany voices doubt over whether Spanish cucumbers were responsible for the E. Coli spread (Federal Office of Consumer Protection and Food Safety — BVL; BfR; Robert Koch Institute — RKI).
01 June	Europe's top health official John Dalli says the bloc is confronted with "a serious crisis" and that further testing is needed to pinpoint the source of the outbreak. BfR (The Federal Institute for Risk Assessment — Germany) eliminates the link between Spanish cucumbers and EHEC outbreak "EHEC germs on Spanish cucumbers do not correspond to the pathogen type of the patients concerned" (BfR).
03 June	Creation of the German EHEC Task Force by the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV).
05 June	Vegetable sprouts from the German region of Lower-Saxony are suspected of being the source of the outbreak (BVL, BfR, RKI).
10 June	Revised Consumption Advice: Germany identifies contaminated sprouts as the source of the bacteria — eat no raw sprouts, lifting its warning on eating raw lettuce, tomatoes and cucumbers (BfR, BVL).
14 June	A 2-year-old boy from Northern Germany becomes the first child to die as a result of the outbreak.
24 June	French authorities announce that a cluster of 7 E. Coli patients had been linked to both sprouts and the EO104, but the patients had no known connection to the German outbreak. The French seeds were traced to a seed company in the UK.
1 July	Suspicious outbreak. Fenugreek sprouts from Egypt were withdrawn from the market.
5 July	The German EHEC Task Force was shut down: the source of infection — fenugreek seeds — was successfully identified (BfR).
26 July	Robert Koch Institute (RKI) declares the end of the outbreak (RKI).
27 July	ECDC provide an update on figures affected by the outbreak in EU/EEA Member States: 3,785 cases (of which 782 suffered kidney failure or severe kidney damage), and from which 45 deaths occurred.



Table 2. Ways of Coping (adapted from Skinner et al., 2003 and Zimmer-Gembeck & Skinner, 2011)

Class of concern	Challenge vs. Threat	Family of Coping	Definition	Ways of coping
RELATEDNESS	Challenges to Self	<b>Self-reliance</b>	Desiring, choosing, or attempting to deal with a stressful event on one's own.	<i>Shouldering</i>
	Challenges to Context	<b>Support seeking</b>	Approaching others to seek support (informational support, tangible support and emotional).	<i>Comfort seeking Help seeking</i>
COMPETENCE	Challenges to Self	<b>Problem Solving</b>	Taking specific actions to deal directly with a situation and negotiating and compromising toward a resolution.	<i>Strategizing</i>
	Challenges to Context	<b>Information Seeking</b>	Find additional contingencies; find out more about the situation and obtain guidance from social-network members.	<i>Study Observe</i>
AUTONOMY	Challenges to Self	<b>Accommodation</b>	Adjustment to the options that are currently available, including not only assenting to current constraints, but also minimization, distraction, positive restructuring, and other actions that flexibly adjust preferences to available options.	<i>Cooperation Concession Committed compliance</i>
	Challenges to Context	<b>Negotiation</b>	Attempts to increase options, compensation or trade-offs in return for concessions. Includes persuasion, bargaining and appeals.	<i>Compromise</i>
RELATEDNESS	Threats to Self	<b>Delegation</b>	Find limits of resources. Cry, show distress, complain.	<i>Dependency Demanding Clinging Pestering</i>
	Threats to Context	<b>Isolation</b>	Withdrawing from social contact or refusing social contact (if provided, code target person: caregiver, teacher, adult, friend, peer).	<i>Withdrawal Freeze</i>
COMPETENCE	Threats to Self	<b>Helplessness</b>	Giving up, passivity, or confusion in the face of demands.	<i>Random attempts Flailing Falling down the stairs</i>
	Threats to Context	<b>Escape</b>	Physically leaving the site of a stressful transaction (behavioural escape) or mentally withdrawing from a stressful transaction (cognitive escape); refusing to acknowledge the stressful elements of a situation (denial).	<i>Avoidance Flight</i>
AUTONOMY	Threats to Self	<b>Submission</b>	Passive and repetitive focus on the negative and damaging features of a stressful transaction; it includes lower order ways of coping, such as intrusive thoughts, negative thinking, catastrophizing, anxiety amplification, self-blame, and fear.	<i>Rigidity Perseveration Unresponsiveness</i>
	Threats to Context	<b>Opposition</b>	Refusing to cooperate, active non-compliance, or doing the opposite of what is requested or expected.	<i>Aggression</i>

Table 3. Descriptive results for coping families, for certainty and uncertainty periods

		Certainty			Uncertainty			Total			
		Adjusted			Adjusted						
		<i>n</i>	%	residual	<i>n</i>	%	residual	<i>n</i>	%		
Coping Families	Challenge	Self	Self-Reliance	12	3.21%	1.1	29	2.21%	-1.1	41	2.43%
			Problem Solving	15	4.01%	1.9	29	2.21%	-1.9	44	2.61%
			Accommodation	70	18.72%	-1.0	276	21.00%	1.0	346	20.50%
		Context	Support Seeking	33	8.82%	-0.6	130	9.89%	0.6	163	9.66%
			Information Seeking	75	20.05%	1.7	214	16.29%	-1.7	289	17.12%
			Negotiation	20	5.35%	2.2	39	2.97%	-2.2	59	3.50%
	Threat	Self	Delegation	40	10.70%	0.0	140	10.65%	0.0	180	10.66%
			Helplessness	10	2.67%	-1.8	63	4.79%	1.8	73	4.32%
			Submission	5	1.34%	-3.0	62	4.72%	3.0	67	3.97%
		Context	Isolation	7	1.87%	1.1	15	1.14%	-1.1	22	1.30%
			Escape	36	9.63%	2.2	83	6.32%	-2.2	119	7.05%
			Opposition	51	13.64%	-1.9	234	17.81%	1.9	285	16.88%

Table 4. Examples of coping instances, within each family of coping corresponding to Challenges to Context

Family of Coping	Tweets (coping instances)	Translation	Way of coping
Support seeking	“Es verdad q los vecinos d Chueca han desmentido q les afecte mucho la bacteria escherichia ecoli?”	It is true that Chueca neighbours have denied that the escherichia ecoli bacteria affects them much?	Help seeking
	‘E. coli’: la bacteria de las hamburguesas (y el pepino?) http://t.co/jxGVkjg si ya me lo dec��a mi madre, hija no comas pepino q repite	‘E. coli’: the hamburger bacteria (and cucumber?) http://t.co/jxGVkjg my mother has told me, daughter, do not eat cucumber it repeats	Help seeking
	Alguien mas piensa q a los laboratorios de la gripe A, aviar, vacas locas y dem��s se les ha ido la mano este a��o con la E.coli mutante?	Anyone else thinks that the labs of A flu, avian flu, mad cows and the like had much in their hands this year with the mutant E.coli?	Help seeking
	@*** espero que sea eso y no la bacteria EColi que ha matado a 6 alemanes :S te quiero por si acaso.	@*** hope it's that and not the Ecoli bacteria that has killed six German people :S I love you just in case.	Comfort seeking
Information Seeking	Ahora se han fijado en la carne. Recomend��n no comer carne cruda por bacteria E. coli que brot�� en Europa <a href="http://tinyurl.com/6z364x9">http://tinyurl.com/6z364x9</a>	Now they’re focusing on meat. They recommend not to eat raw meat due to E. coli bacteria that showed up in Europe <a href="http://tinyurl.com/6z364x9">http://tinyurl.com/6z364x9</a>	Observe
	Acabo d recordar q el documental Food Inc. denuncia, entre otras cosas, la bacteria mortal E. Coli, encontrada n pepinos <a href="http://t.co/qWGzmd1">http://t.co/qWGzmd1</a>	I just remembered that the Food Inc. documentary denounces, among other things, the deadly E. Coli bacteria, found in cucumbers <a href="http://t.co/qWGzmd1">http://t.co/qWGzmd1</a>	Observe
	Leyendo 'Alemania localiza el origen de la infecci��n de 'E. Coli' en una explotaci��n nacional de soja' http://t.co/ExlpdOy v��a @*** #Epidemia E-Coli EHEC: 2000 casos en Europa y 2 en EE.UU.   lagranepoca.com http://t.co/wnkOKfS “Qu��, habr�� sucedido en el norte de Alemania?”	Reading 'Germany locates the source of the E. Coli infection on a national soybean exploration http://t.co/ExlpdOy via @*** E-Coli #Epidemic EHEC: 2000 cases in Europe and 2 in U.S.   Lagranepoca.com http://t.co/wnkOKfS “What happened in the north of Germany?”	Study
	“Bacteria e-coli en Alemania y llega a Espa��a? “Por qu��, los pepinos son nuestros?: La junta andaluza afirma que... <a href="http://bit.ly/lbk6YC">http://bit.ly/lbk6YC</a>	E-coli bacteria in Germany arrives in Spain? Why, are the cucumbers ours?: The Andalusian municipality says... <a href="http://bit.ly/lbk6YC">http://bit.ly/lbk6YC</a>	Study
Negotiation	Alemania, en alerta sanitaria por una bacteria intestinal (e-coli). El Ministerio lo investiga. Alivio al saber que no est�� en la cerveza...	Germany, on health alert due to an intestinal bacteria (e-coli). The Ministry is investigating. Relief for knowing that is not in beer ...	Compromise
	Esto era lo que les faltaba a los japoneses O-157 strain of E. coli detected in food poisoning case in Toyama (Japan) http://j.mp/kuncyX Spare a thought for the Spanish farmers brought to their knees by the false E-coli accusations.	This was just what the Japanese were needing O-157 strain of E. coli detected in food poisoning case in Toyama (Japan) http://j.mp/kuncyX Spare a thought for the Spanish farmers brought to their knees by the false E-coli accusations.	Taking others perspective Taking others perspective
	Pregunto, si en casa todos tomamos verduras espa���olas y estamos m��s sanos que una manzana, no ser�� que la culpa de ecoli es otra???	I wonder: if we all have Spanish vegetables at home and we are perfectly healthy, could the cause of ecoli be another one???	Blamenessness

Table 5. Examples of coping instances, within each family of coping corresponding to Challenges to Self

Family of Coping	Tweets (coping instances)	Translation	Way of coping
Self-reliance	La crisis con la E coli, nos hace recalcar la importancia en le higiene personal y en la preparaciÇn de alimentos	The E coli crisis makes us remember the importance of personal hygiene and in food preparation	<i>Accept responsibility</i>
	@*** cuidado con la soja que me han dicho que es de e.coli (8)	@*** be careful with soy as someone said to me that it is of e.coli (8)	<i>Concern for others</i>
	MaÇñana publicarÇ, mi pequeÇña contribuciÇn al tema de E. Coli. Creo que os interesarÇ-	Tomorrow, I will publish my small contribution to the subject of E. Coli. I think you will be interested	<i>Shouldering</i>
	@*** Un cafÇ, estarÇda muy bien. He pensado que a ver si lo que te ocurriÇü a ti fue lo de la E. coli... No comerÇdas en algÇšn alemÇ-n?	@*** A coffee will be fine. I was wondering if what had happened to you was E. coli ... Didn't you eat in some German?	<i>Concern for others</i>
Problem Solving	@*** Se trata de la bacteria E. coli, que puede contaminar cualquier alimento. Bien lavados y pelados no hubiesen dado problema	The bacteria is E. coli, which can contaminate any food. Well washed and peeled they wouldn't have been a problem	<i>Strategizing/ Determination</i>
	Para evitar infecciones:estate ALERTA de higiene, tanto de lo q compras, cocinas	To prevent infections: BEWARE of hygiene, in what you buy, cook	<i>Strategizing</i>
	Al final contra ecoli agua y jabÇn!!	After all against ecoli water and soap!!	<i>Strategizing</i>
	La Bacteria E.Coli se encuentra en la piel del pepino. Por lo tanto, lavÇ-ndolo bien y pelÇ-ndolo no ahÇđ ningÇšn problema de contagio.	E.Coli bacteria is found on the cucumber skin. Therefore, washing and peeling it well means there is no problem of contamination at all.	<i>Strategizing/ Confidence</i>
Accommodation	Sin duda: "Pepinos verdes fritos" ... y sin riesgo de E. Coli. #pelispepineras	No doubt: "Fried Green Cucumbers" ... without risk of E. Coli. #pelispepineras	<i>Acceptance</i>
	We're going to have cucumber salad for dinner. There's a surprise: we have drawn #Merkel face with them! #VivaelPepinoespaÇñol #ecoli #Germany	We're going to have cucumber salad for dinner. There's a surprise: we have drawn #Merkel face with them! #VivaelPepinoespaÇñol #ecoli #Germany	<i>Acceptance</i>
	Media #Europa se contamina con la bacteria "e coli" al comer #pepinos despuÇ,s de haberles dado otro uso. Imaginas cual??	Media #Europe contaminates itself with the "e coli" bacteria by eating #cucumbers after having given them another use. Can you imagine what that was??	<i>Acceptance</i>
	@*** no es una toxina, es una bacteria, de hecho todos la tenemos en el intestino(aunque en pocas cantidades). se llama E.coli GIYF	@***it is not a toxin, it is a bacteria, in fact we all have it in our intestines (though in small quantities). it is called E.coli GIYF	<i>Cooperation</i>
	No puede ser, el E. coli no se transmite por el #pepinoespaÇñol , dice mi seÇñora.	It cannot be, E. coli can't be transmitted through Spanish cucumbers, my wife said.	<i>Committed compliance</i>

Table 6. Examples of coping instances, within each family of coping corresponding to Threats to Context

Family of Coping	Tweets (coping instances)	Translation	Way of coping
Isolation	Me acaban de justificar la banalizaciÇün de las muertes por E. Coli en AlemanÇđa usando el tema del #15m y #acampadasol. Flipo y bloqueo.	Someone just justified to me the trivialization of E. Coli deaths in Germany using the theme of #15m and #acampadasol. I freak and block.	<i>Freeze</i>
	Q no coman ni beban nada hasta descubrirlo RT@rtve: Alemania descarta q el origen del brote d E. coli sea una explotaciÇün de soja del paÇös	Do not eat or drink anything until it's been discovered RT @rtve: Germany dismisses that the origin of the E. coli outbreak is one of the country's soya exploration	<i>Freeze</i>
	#pepinos vs. E.coli,demasiado tarde para confirmar que no proceden de EspaÇña. Creo firmemente que Europa no nos tiene en mucha estima.	# cucumbers vs. E.coli, too late to confirm that they do not come from Spain. I firmly believe that Europe does not have much appreciation for us.	<i>Loneliness</i>
	PatÇün en las noticias de la Ser....me han sangrado los oÇödos... dice que los pepinos alemanes estÇ-n contaminados con el virus E.coli...puff	Rude man on Ser news... my ears bled... said the German cucumbers are contaminated with the E.coli virus ... puff	<i>Desolation</i>
Escape	Cucumbers from Spain cause 10 deaths from E, coli outbreak. I think I will skip salads for a while!	Cucumbers from Spain cause 10 deaths from E, coli outbreak. I think I will skip salads for a while!	<i>Avoidance</i>
	@***: ¶No se estarÇ alarmando innecesariamente con bacteria E.coli? Me viene a la memoria la Gripe A...	@***: Aren't people being unnecessarily alarmed by E.coli bacteria? Reminds me of the A Flu. ..	<i>Avoidance</i>
	@*** No se, pero me da miedo ir al Carrefour para comprarlos en vinagre y que la E.Coli se adueÇne de mÇö.	@*** I don't know, but I'm afraid to go to Carrefour to buy them pickled and that E.coli takes control of me.	<i>Fear</i>
	El otro dia me comi un pepino, antes de saber lo de la bacteria ecoli, desde entonces tengo miedo!! #pepinos	The other day I ate a cucumber, before I knew about the ecoli bacteria, since then I am afraid! #cucumbers	<i>Fear</i>
	e. coli outbreak over here.. guess i wont be eating my vegetables anytime soon =[	e. coli outbreak over here.. guess i wont be eating my vegetables anytime soon =[	<i>Pessimism</i>
Opposition	Boicot productos y empresas alemanas por #pepino #pepinos #Alemania #ecoli. No comprar nada en supermercados Lidl ni Aldi!!	Boycott German products and companies for #cucumber #cucumbers #Germany #ecoli. Do not buy anything in Lidl or Aldi supermarkets!	<i>Aggression</i>
	Un agente alemÇ-n dice ahora que los culpables del brote de e-coli son los brotes de soja alemanes? Los kilos de pepino que le metÇđa por...	A German agent now says that the ones to blame for the e-coli outbreak are German soy sprouts? The kilos of cucumber I would shove up their...	<i>Aggression</i>
	AsÇö que la bacteria E.coli estaba en la soja alemana.....muy bien Alemania! eso de echarnos la culpa cuando lo teneis vosotros....	So the E.coli bacteria was in German soya..... very well Germany! Blaming us when you're actually to blame....	<i>Blaming others</i>

Malditos alemanes! RT @El_Iberico: La bacteria E.Coli parece ser que se encuentra en vegetales en Uelzen, Hamburgo . <a href="http://bit.ly/jUGDbd">http://bit.ly/jUGDbd</a>	Damn Germans! RT @El_Iberico: the E.Coli bacteria seems to have been found in vegetables in Uelzen, Hamburg. <a href="http://bit.ly/jUGDbd">http://bit.ly/jUGDbd</a>	<i>Anger</i>
Observo la proverbial chapuzada alemana en el tratamiento de E coli. #mitosymentiras	I observe the proverbial German splash in treating the E coli #mythsandlies	<i>Venting</i>
El origen de la infecciÇün por 'E. Coli' podrÇđa estar en brotes de soja alemanes!!! TE ENTERAS MERKEL????	The source of the infection by 'E. Coli 'could be in German bean sprouts! GET IT MERKEL????	<i>Explosion</i>

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Table 7. Examples of coping instances, within each family of coping corresponding to Threats to Self

Family of Coping	Tweets (coping instances)	Translation	Way of coping
Delegation	#E. coli propongo #boicot_cerveza_alemana en respuesta a los #pepinos defende nuestro campo	# E. coli I propose # boycott_to_German_beer in response to #cucumbers defend our countryside	<i>Demanding</i>
	El virus E.coli solo ha aparecido en Alemania. Y se transmite entre personas. Cierre de fronteras con Alemania pero YA!!	The E.coli virus has appeared only in Germany. And it is transmitted between people. Close the borders with Germany right NOW!	<i>Demanding</i>
	Si escuchan grandes declaraciones sobre E.Coli desde la Euroc... on Twitpic: <a href="http://t.co/USrP60K">http://t.co/USrP60K</a> via @AddThis -> Para eso les pagamos?	You hear grand statements about E.Coli from Euroc ... on Twitpic: via @ AddThis <a href="http://t.co/USrP60K">http://t.co/USrP60K</a> -> For this we pay them?	<i>Dependency</i>
Helplessness	La bacteria E.coli se le resiste a los alemanes, ahora tampoco son los brotes de soja. Se ruegan anÇ-lisis mÇ-s exhaustivos.	The E.coli bacteria resists the Germans, now it's not the soy sprouts anymore. More exhaustive analyses are requested.	<i>Dependency/ Demanding</i>
	Ahora dicen que el origen del brote de E.Coli es de la soja... pepinos, ahora la soja... la madre naturaleza quiere matarnos.	Now they say that the origin of the E. coli outbreak is soy ... cucumber, and now soy... mother nature wants to kill us.	<i>Discouragement</i>
	Los pepinos son cancerÇógenos y los mÇüviles tienen E. Coli. Ya no te puedes fiar de nada. Que asco.	Cucumbers are carcinogenic and mobiles have E. Coli. You cannot trust anything. That sucks.	<i>Random attempts</i>
	Empieza a no molar NADA lo del E.coli... ahora cada vez que voy al supermercado me acojono...y maÇñana voy mÇ-s al norte aÇn!	This thing about E.coli is starting to not be cool AT ALL... Now every time I go to the supermarket I get intimidated ... and tomorrow I go further north!	<i>Random attempts</i>
	Justo ayer comprÇ, germinados de alfalfa y de soja y ahora les estÇ-n echando la culpa del E.coli x.x	Just yesterday I bought alfalfa and soy sprouts and now they are blaming them for E.coli x.x	<i>Self-doubt</i>
Submission	'E.coli': la bacteria de las hamburguesas (¶y el pepino?)	'E.coli': the hamburgers bacteria (and cucumber?)	<i>Perseveration</i>
	<a href="http://t.co/K4w8qHk">http://t.co/K4w8qHk</a> Si me tengo q morir q sea de un gazpachazo, de eso no me quito	<a href="http://t.co/K4w8qHk">Http://t.co/K4w8qHk</a> If I must die let it be by gazpacho, which I'm not going to stop eating	
	Aseguran que la crisis del E. Coli estÇ- controlada y que se descarta una epidemia. AHORA empiezo a estar preocupado.	They say the E. Coli crisis is controlled and that an epidemic is ruled out. NOW I begin being worried.	<i>Perseveration</i>
	DespuÇ,s que supe del daÇño que hace la bacteria E. coli jamÇs mirarÇ, una lechuga con los mismos ojos.	After I heard about the damage that the E. coli causes, I will never look at a lettuce with the same eyes.	<i>Rigidity</i>
	No comments...Prozac Killing E. coli in the Great Lakes - <a href="http://tinyurl.com/3p3ypfe">http://tinyurl.com/3p3ypfe</a>	No comments...Prozac Killing E. coli in the Great Lakes - <a href="http://tinyurl.com/3p3ypfe">http://tinyurl.com/3p3ypfe</a>	<i>Unresponsiveness</i>
	No sÇ, vosotros, pero cada vez que veo en la TV una imagen de una placa de petri con la puta e.coli, me dan unos ecalofrios...que asco, joder	I don't know, about you, but every time I see a picture on TV of a petri dish with that e.coli bitch, I have some chills ... that sucks, fuck	<i>Disgust</i>

